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INSTRUCTION BOOK

ANALOG AND DIGITAL PATCH PANELS

PART OF

FLIGHT SERVICE AUTOMATION SYSTEM

CONTRACT DTFA01-81-C-10039

CONTRACTOR

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RECORD OF CHANGES

CHANGE TO BASIC	SUPPLEMENTS			OPTIONAL USE	CHANGE TO BASIC	SUPPLEMENTS			OPTIONAL USE

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SECTION 1

GENERAL INFORMATION

1.1 INTRODUCTION. - This manual provides information concerning the Analog Patch Panel, 153-020-12VF-M1, and the Digital Patch Panels, 157-011-00 and 157-002C-00, manufactured by Dynatech Data Systems. Section 1 of this manual provides general information. Section 2 provides information concerning operation of the patch panels including controls and indicators. Section 3 provides theory of operation. Section 4 provides maintenance procedures. Section 5 provides parts lists.

1.2 DESCRIPTION. - The Analog Patch Panel, 153-020-12VF-M1, is shown in figure 1-1. The Analog Patch Panel provides patching capabilities for up to 12 modem connections and 12 central office (TELCO) connections. A +5 VDC power supply, amplifier board, and speaker are included in the Analog Patch Panel to allow audible monitoring of patched data.

The Digital Patch Panel, 157-011-00 is shown in figure 1-2. The only difference between the two types of Digital Patch Panels is that the 157-011-00 patch panel contains six 24 circuit jacks (DP-24-5) and six 32 circuit jacks (DP-32-5) while the 157-002C-00 patch panel contains twelve 24 circuit jacks (DP-24-5). The DP-24-5 circuit jacks are for use with RS-232 interface specifications. The DP-32-5 circuit jacks are for use with RS-449 interface specifications. The pin definitions for the RS-232 and RS-449 connectors on the rear of the Digital Patch Panel are in table 1-1.

1.3 INTERFACE. - Interface diagrams for the Analog and Digital Patch Panels are shown in figures 1-3 and 1-4, respectively. The Analog Patch Panel directly connects a maximum of 12 modems to a maximum of 12 telephone central office (TELCO) connections. There are two rows of 12 connectors on the rear of the Analog Patch Panel marked 1 through 12. Modem connections are made to the top row of connectors and TELCO connections are made to the bottom row of connectors. A modem connection made to the connector labeled 1 on the back panel is directly connected to the TELCO connection labeled 1 on the back panel. A modem jack, TELCO jack, and MON (monitor) jack are provided on the front panel of the Analog Patch Panel to allow patching and monitoring of each rear panel connection. There are 12 of each type of front panel jacks on the front panel. A MON IN (monitor input) jack is also included on the front panel to allow patching of a particular connection for testing or audible monitoring.

The Digital Patch Panel directly connects a maximum of 12 modems to a maximum of 12 computer equipment connections. There are 12 circuits jacks used on the patch panel. The 157-011-00 patch panel provides six DP-24-5 circuit jacks and six DP-32-5 circuit jacks. The DP-24-5 circuit jacks are used to connect RS-232 signals and the DP-32-5

circuit jacks are used to connect RS-449 signals. The 157-002C-00 patch panel provides 12 DP-24-5 circuit jacks and is used to interface only RS-232 signals. A MODEM jack, COMP (computer) jack, and MON (monitor) jack is provided on the front panel of each circuit jack to allow patching and monitoring of each rear panel connection. A MON IN (monitor input) jack is also included on the front panel to allow patching of a particular connection for testing.

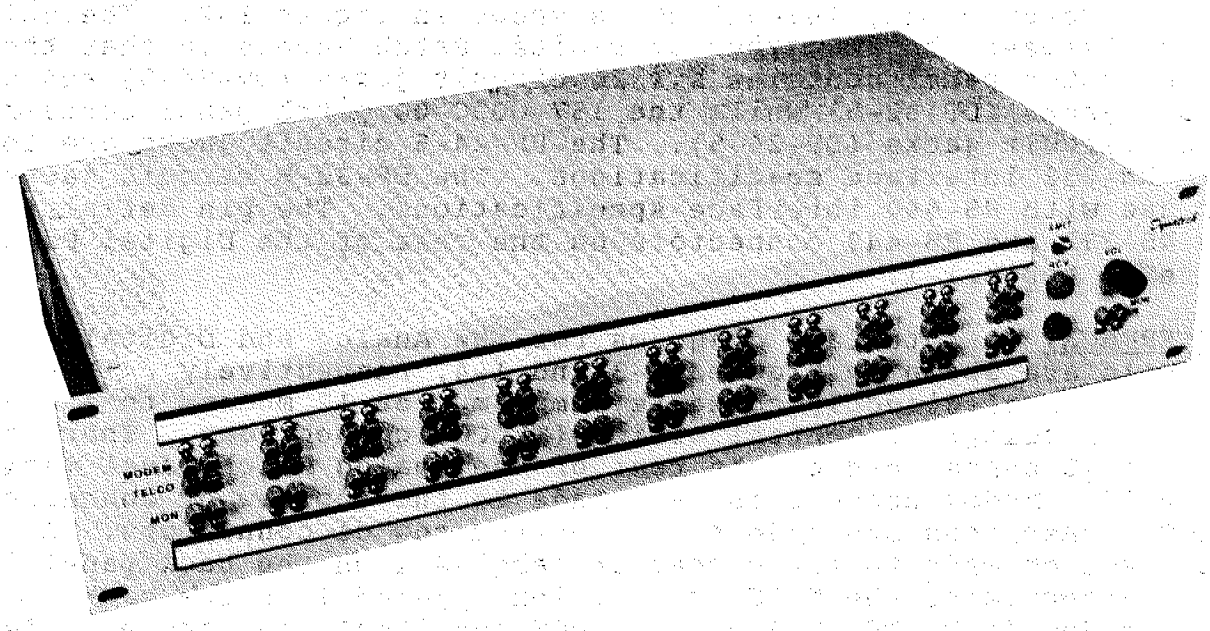

Figure 1-1. Analog Patch Panel

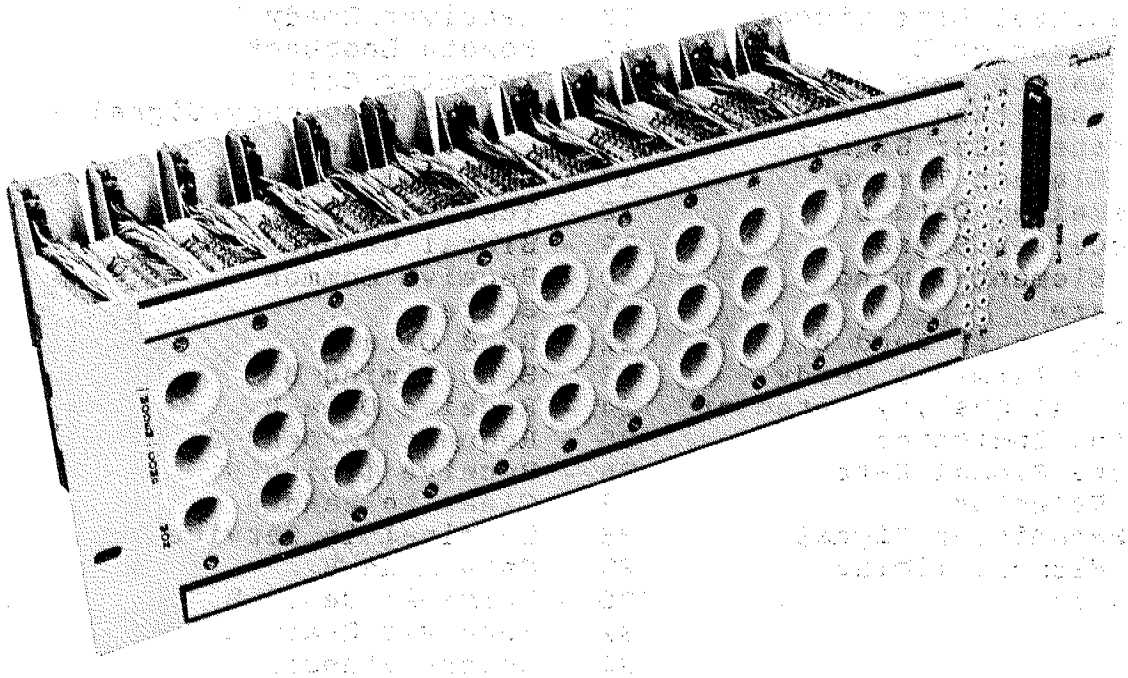

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Figure 1-2. Digital Patch Panel

Table 1-1. RS-232 and RS-449 Pin Assignments

RS-232	RS-449
1 - Protective Ground	1 - Shield
2 - Transmitted Data A	2 - Signaling Rate indicator
3 - Received Data A	3 - Spare
4 - Request to Send A	4 - Send Data A
5 - Clear to Send A	5 - Send Timing A
6 - Data Set Ready	6 - Receive Data A
7 - Signal Ground/Common	7 - Request to Send A
8 - Received Line Signal Detector A	8 - Receive Timing A
9 - Spare	9 - Clear to Send A
10 - Spare	10 - Local Loopback A
11 - Spare	11 - Data Mode A
12 - Received Line Signal Detector B	12 - Terminal Ready A
13 - Clear to Send B	13 - Receiver Ready A
14 - Transmitted Data B	14 - Remote Loopback
15 - Transmitter Signal Element Timing	15 - Incoming Call
16 - Received Data B	16 - Select Frequency/Signal Rate Select
17 - Receiver Signal Element Timing	17 - Terminal Timing A
18 - Spare	18 - Test Mode
19 - Request to Send B	19 - Signal Ground
20 - Data Terminal Ready	20 - Receive Common
21 - Signal Quality Detector	21 - Spare
22 - Ring Indicator	22 - Send Data B
23 - Data Signal Rate Selector	23 - Send Timing B
24 - Transmitter Signal Element Timing	24 - Receive Data B
25 - Spare	25 - Request to Send B
	26 - Receive Timing B
	27 - Clear to Send B
	28 - Terminal in Service
	29 - Data Mode B
	30 - Terminal Ready B
	31 - Receiver Ready B
	32 - Select Standby
	33 - Signal Quality
	34 - New Signal
	35 - Terminal Timing B
	36 - Standby Indicator
	37 - Send Common

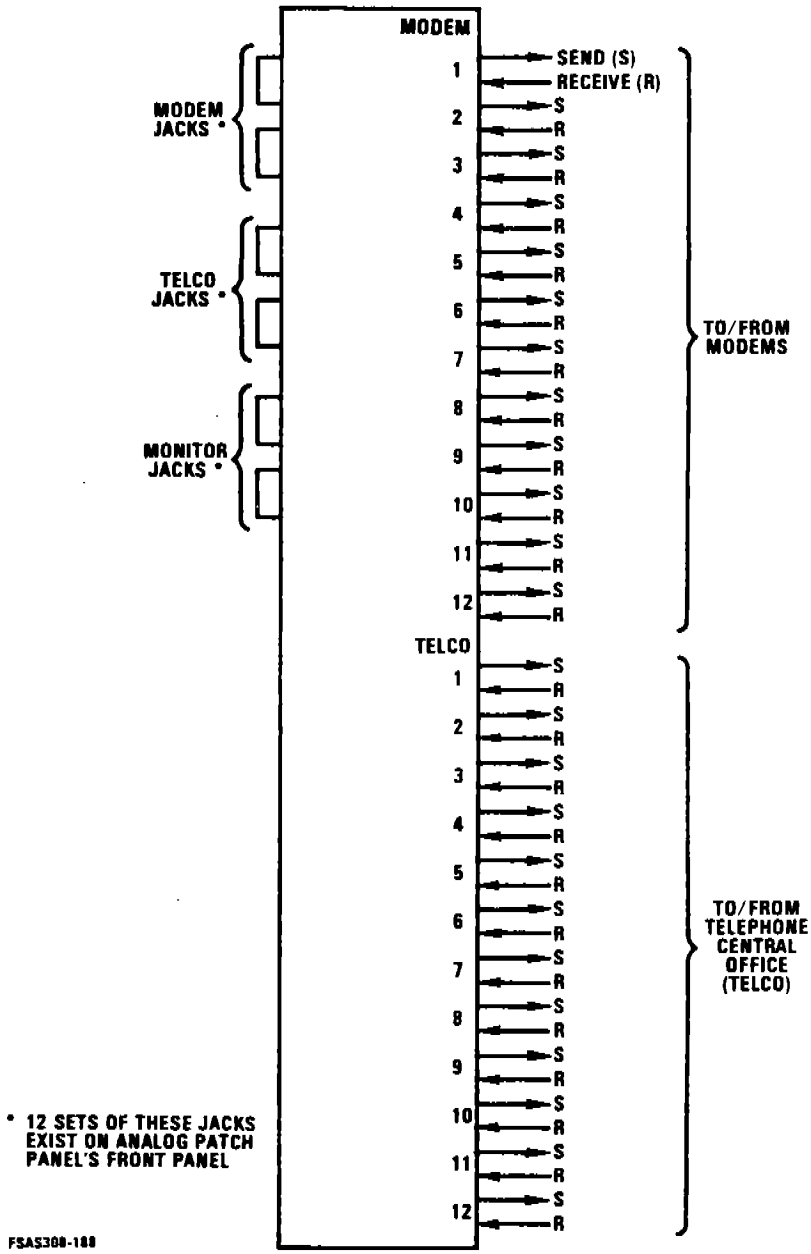
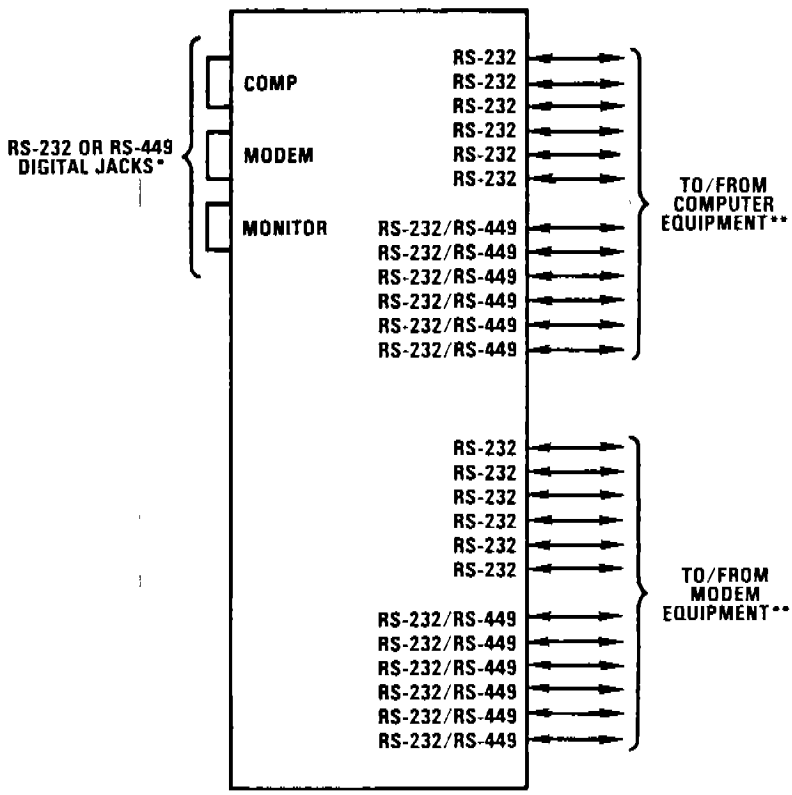


Figure 1-3. Analog Patch Panel Interface Diagram



* 12 SETS OF THESE JACKS EXIST ON DIGITAL PATCH PANEL'S FRONT PANEL

** THESE REAR PANEL CONNECTORS ARE ALL RS-232 ON 157-002C-00 PATCH PANEL. 157-011-00 PATCH PANEL CONTAINS SIX RS-232 AND SIX RS-449 CONNECTORS FOR EACH GROUP

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Figure 1-4. Digital Patch Panel Interface Diagram

SECTION 2

OPERATION

2.1 INTRODUCTION. - This section provides a description of the controls, indicators, and connectors used on the Analog and Digital Patch Panels. Operating procedures for both patch panels are also provided in this section.

2.2 CONTROLS AND INDICATORS. - The controls, indicators, and connectors provided on the Analog Patch Panel are shown in figure 2-1 and described in table 2-1. The controls, indicators, and connectors provided on the Digital Patch Panel are shown in figure 2-2 and described in table 2-2.

2.3 OPERATING PROCEDURES. - The following paragraphs provide the operating procedures for the Analog and Digital Patch Panels.

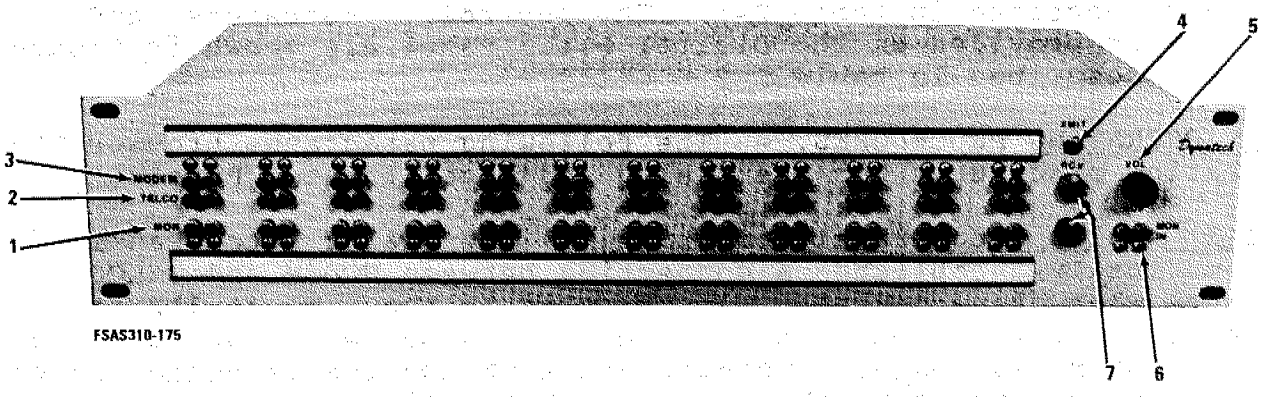
2.3.1 Analog Patch Panel Operation. - The Analog Patch Panel automatically establishes a connection between MODEM and TELCO devices when these devices are connected to the same J1-J12 rear panel connector column. For instance, if a modem is connected to the J1 MODEM rear panel connector and a TELCO line is connected to the J1 TELCO connector, the modem and TELCO lines are connected. This connection becomes broken if a patch is made using a patch cord in the front panel TELCO or MODEM jacks corresponding to the J1 rear panel connector.

The 12 MON (monitor) jacks on the front panel of the Analog Patch Panel allow monitoring of any one of the 12 possible connections using the internal audio amplifier and speaker. This is performed by patching the MON jacks containing the TELCO side of the desired signal into the MON IN jacks on the far right side of the patch panel. The audio level of the monitored signal can be controlled by using the VOL ADJ (volume adjust) switch. The send or receive side of the monitored circuit can be selected by setting the XMIT/RCV switch to the appropriate position.

2.3.2 Digital Patch Panel Operation. - The Digital Patch Panel automatically establishes a connection between the MODEM and COMP (computer) devices when these devices are connected to the same DP-24-5 or DP-32-5 circuit jack on the rear of the patch panel. This connection becomes broken if a patch is made using a patch cord in the front panel MODEM or COMP jacks corresponding to the rear panel connector.

The 12 MON (monitor) jacks on the front panel of the Digital Patch Panel allow monitoring of any one of the 12 possible connections using the 24 or 32 mini-phone jacks on the front panel. This monitoring or test is performed by patching the MON jack containing

the MODEM side of the desired signal into the MON IN jack on the far right side of the patch panel. Monitoring of the circuit can be performed by connecting test equipment to the 24 or 36 pin monitor connector or the 24 or 36 pin mini-phone jacks.



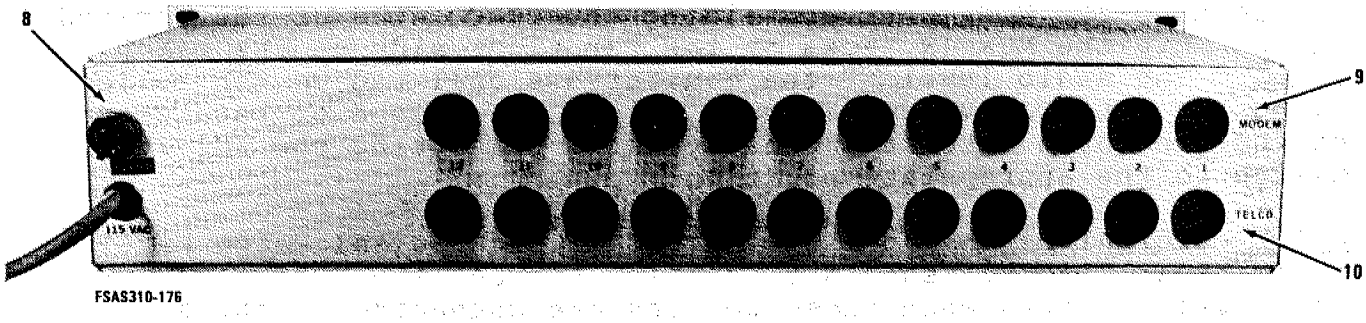
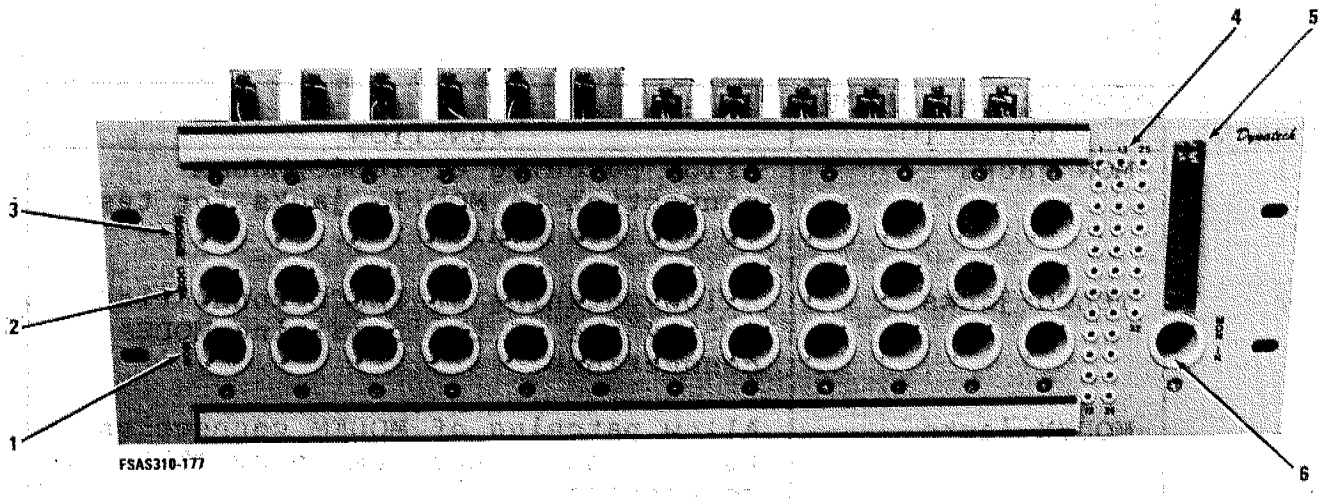
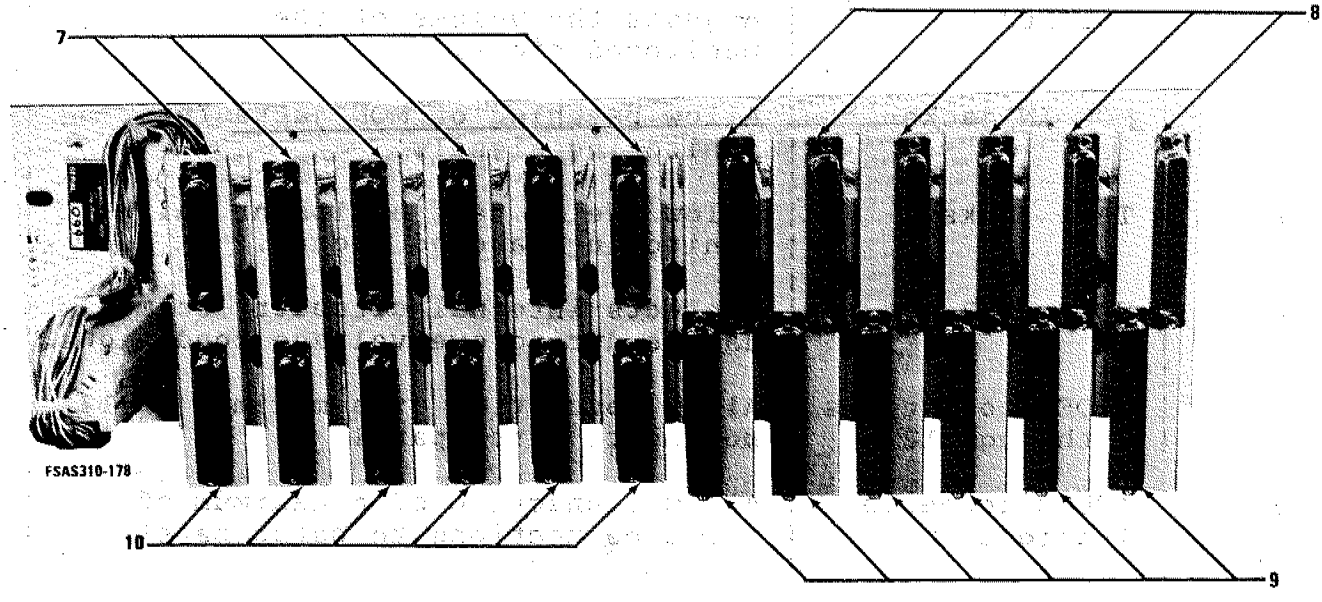


Figure 2-1. Analog Patch Panel Controls, Indicators, and Connectors

Table 2-1. Analog Patch Panel Controls, Indicators, and Connectors

FIG.2-1 INDEX NO.	CONTROL/INDICATOR/ CONNECTOR	FUNCTION
1	MON jacks	Allow patching of TELCO/MODEM connection to MON IN jacks for test or audible monitoring.
2	TELCO jacks	Allow patching of TELCO connection to any one of the remaining MODEM connections.
3	MODEM jacks	Allow patching of MODEM connection to any one of the remaining TELCO connections.
4	XMIT/RCV switch	Allows monitoring of either send (XMIT) or receive (RCV) side of monitored signal.
5	VOL ADJ	Adjusts the volume of the monitored signal.
6	MON IN jacks	Allow patching of MON jacks for monitoring signals.
7	Test jacks	Allow use of test equipment while monitoring patched signal.
8	Fuse, 1/2 A	Protects internal circuitry from damage during overvoltage conditions.
9	MODEM connectors, 1 through 12	Allow connection of a maximum of 12 modems to patch panel.
10	TELCO connectors, 1 through 12	Allow connection of a maximum of 12 TELCO connections to patch panel.





NOTE: 157-011-00 PATCH PANEL IS SHOWN.

Figure 2-2. Digital Patch Panel Controls, Indicators, and Connectors

Table 2-2. Digital Patch Panel Controls, Indicators, and Connectors

FIG.2-2 INDEX NO.	CONTROL/INDICATOR/ CONNECTOR	FUNCTION
1	MON jack	Allows patching of MODEM/COMP connection to MON IN jack for test purposes.
2	COMP jack	Allows patching of COMP connection to any one of the remaining MODEM connections.
3	MODEM jack	Allows patching of MODEM connection to any one of the remaining COMP connections.
4	Test jacks	Allow use of test equipment while monitoring patched signal. There are 24 jacks on 157-002C-00 patch panel.
5	Test connector	37-pin connector for connecting test equipment to monitored signal. 25-pin connector is used on 157-002C-00 patch panel.
6	MON IN jack	Allows patching of MON jacks for monitoring signals.
7	COMP jack connectors, RS-232	Allow connection of six RS-232 computer equipment connections.
8	COMP jack connectors, RS-449	Allow connection of six RS-449 computer equipment connections. These connectors are for RS-232 on 157-002C-00 patch panel.
9	MODEM jack connectors, RS-449	Allow connection of six RS-449 modem connections. These connectors are for RS-232 on 157-002C-00 patch panel.
10	MODEM jack connectors, RS-232	Allow connection of six RS-232 modem connections.

SECTION 3

THEORY OF OPERATION

3.1 INTRODUCTION. - This section provides the theory of operation for the Analog and Digital Patch Panels. Figure 3-1 provides a schematic diagram of the Analog Patch Panel. Figure 3-2 provides a schematic diagram of the Digital Patch Panel.

3.2 ANALOG PATCH PANEL. - The Analog Patch Panel provides a means of connecting a maximum of 12 modem circuits with a maximum of 12 telephone central office (TELCO) circuits. A schematic diagram of the Analog Patch Panel is shown in figure 3-1. The schematic shows the wiring for the MODEM, TELCO, and MON jacks on the front panel of the patch panel. The audio amplifier and speaker connections are also shown in the schematic.

Modem and TELCO cables are connected to the 12 MODEM connectors and 12 TELCO connectors on the rear of the Analog Patch Panel. These connectors have 6 pins and are directly wired to the front panel jacks as shown in figure 3-1. The MODEM and TELCO jacks are internally connected inside the jack assembly so that they become directly connected upon connection of the cables to the rear panel connectors. When either the MODEM or TELCO jacks are patched using a patch card, the connection between MODEM and TELCO becomes broken. The monitored signal becomes the signal which is connected to the TELCO jack above the MON jack being used.

The MON IN (monitor input) signals are applied to the XMIT/RCV switch, audio amplifier, and speaker. Test points are provided on the front panel for connection of desired monitored signals to selected test equipment.

3.3 DIGITAL PATCH PANEL. - The Digital Patch Panel provides a means of connecting a maximum of 12 modem circuits with a maximum of 12 computer equipment connections. A schematic diagram of the Digital Patch Panel is shown in figure 3-2.

Modem and computer equipment cables are connected to the 12 modem connectors and 12 computer equipment connectors on the rear of the Digital Patch Panel. Each modem and computer equipment connector is attached to a circuit jack. The 157-011-00 patch panel has six RS-232 circuit jacks and six RS-449 circuit jacks. The 157-002C-00 patch panel has 12 RS-449 circuit jacks. The MODEM and COMP jacks in each circuit jack are directly connected internal to the circuit jack. This connection is broken when a patch cord is placed in either of the jacks.

The MON IN (monitor input) signals are distributed to the 32 mini-phone jacks and the 37-pin test connector on the front panel of

the patch panel when using the 157-011-00 patch panel. The 157-002C-00 Digital Patch Panel has 24 mini-phone jacks and a 25-pin test connector on the front panel.

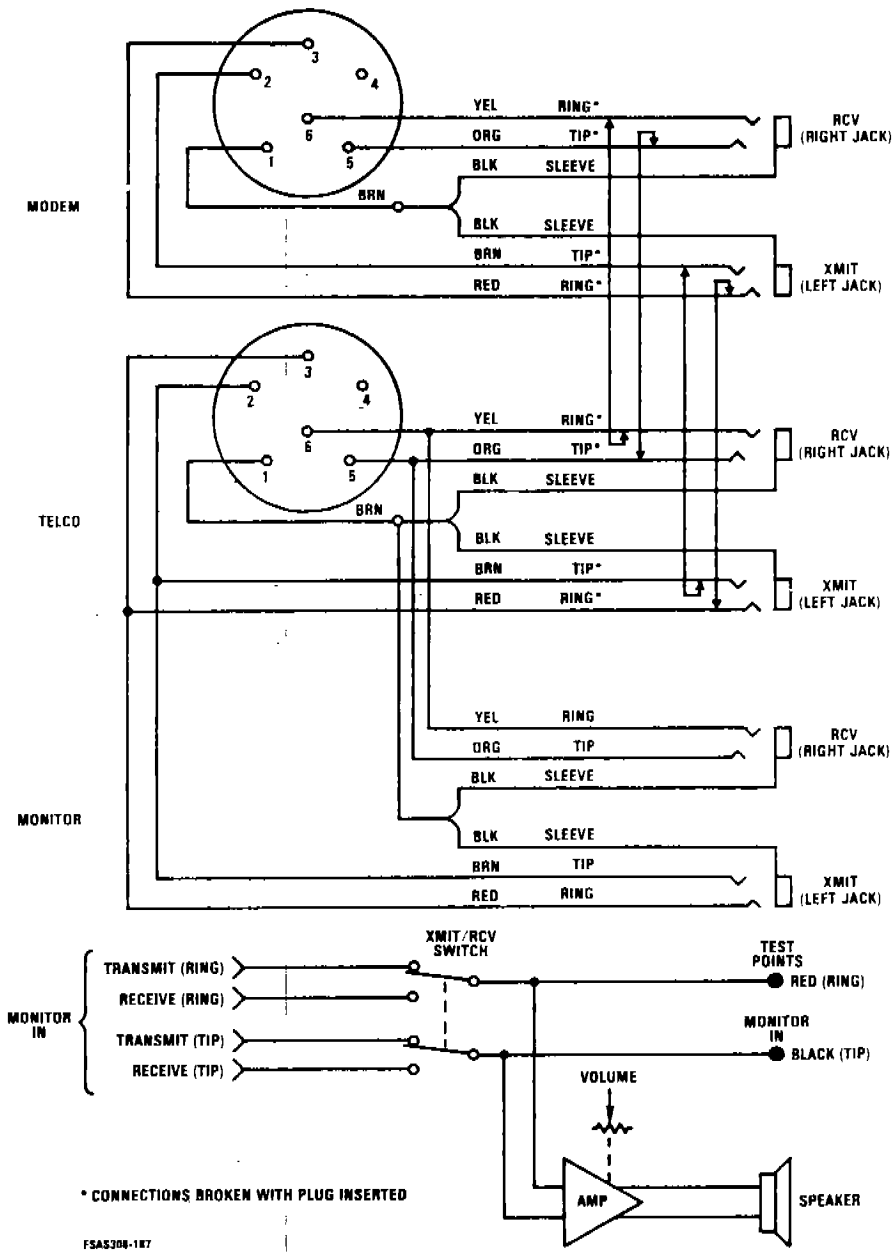
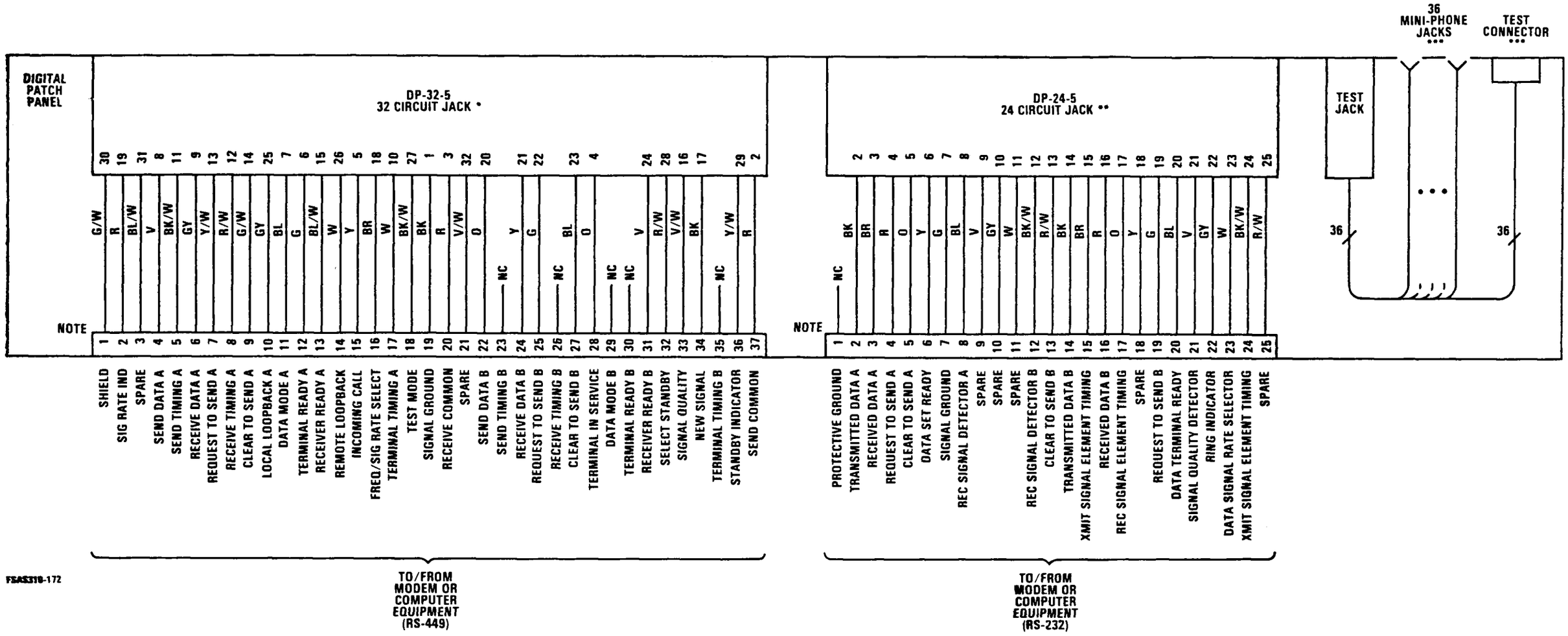


Figure 3-1. Analog Patch Panel Schematic Diagram



NOTE: TWO OF THESE CONNECTORS ARE WIRED TO EACH CIRCUIT JACK.

* 6 OF THESE CIRCUIT JACKS ARE PROVIDED ON DIGITAL PATCH PANEL 157-011-00

** 6 OF THESE CIRCUIT JACKS ARE PROVIDED ON DIGITAL PATCH PANEL 157-011-00. 12 ARE PROVIDED ON 157-002C-00.

*** ONE 36 PIN TEST CONNECTOR AND 36 MINI-PHONE JACKS ARE PROVIDED ON 157-011-00 DIGITAL PATCH PANEL.

ONE 24 PIN TEST CONNECTOR AND 24 MINI-PHONE JACKS ARE PROVIDED ON 157-002C-00 DIGITAL PATCH PANEL.

Figure 3-2. Digital Patch Panel Schematic Diagram

SECTION 4

MAINTENANCE

4.1 INTRODUCTION. - This section provides corrective and preventive maintenance procedures for the Analog and Digital Patch Panels.

4.2 CORRECTIVE MAINTENANCE. - Corrective maintenance for the Analog and Digital Patch Panels consists of replacing circuit jacks, connectors, or amplifier board if found to be defective. Bad wiring or loose connections can be found by tracing wiring according to schematic diagrams provided in section 3 of this manual.

4.2.1 REMOVAL AND REPLACEMENT. - The following paragraphs provide the removal and replacement procedures for replaceable components in the Analog and Digital Patch Panels.

4.2.1.1 DP-24-5 AND DP-32-5 CIRCUIT JACK REMOVAL. - Perform the following procedure to remove the circuit jack from the Digital Patch Panel:

a. Removal two Phillips screws securing circuit jack to front panel.

b. Remove circuit jack from patch panel.

4.2.1.2 DP-24-5 AND DP-32-5 CIRCUIT JACK REPLACEMENT. - Perform the following procedure to replace the circuit jack in the Digital Patch Panel:

a. Place circuit jack in proper position in patch panel.

b. Secure circuit jack to patch panel front panel with two Phillips screws.

4.2.1.3 ANALOG PATCH PANEL JACK REMOVAL. - Perform the following procedure to remove the front panel jacks from the Analog Patch Panel:

a. Remove seven screws securing top cover of patch panel.

b. Remove four screws securing jack to front panel.

c. Remove and tag wires connected to jack terminals.

d. Remove jack from patch panel.

4.2.1.4 ANALOG PATCH PANEL JACK REPLACEMENT. - Perform the following procedure to replace the front panel jack in the Analog Patch Panel:

a. Place and wirewrap tagged wires to jack terminals.

b. Place jack in proper position and secure to front panel with four screws.

c. Replace top cover and secure with seven screws.

4.2.1.5 AMPLIFIER BOARD REMOVAL. - Perform the following procedure to remove the amplifier board (figure 4-1) from the Analog Patch Panel:

a. Remove power from patch panel by disconnecting AC line cord.

b. Remove seven screws securing top cover of patch panel.

c. Remove two screws securing amplifier board to patch panel.

d. Unsolder, remove, and tag wires connected to amplifier board.

e. Remove amplifier board (figure 4-1) from patch panel.

4.2.1.6 AMPLIFIER BOARD REPLACEMENT. - Perform the following procedure to replace the amplifier board in the Analog Patch Panel:

a. Solder tagged wires to proper position on amplifier board.

b. Place amplifier board in proper position in patch panel and secure with two screws.

c. Replace top cover and secure with seven screws.

d. Replace power to patch panel by connecting AC line cord.

4.2.1.7 POWER SUPPLY REMOVAL. - Perform the following procedure to remove the power supply (figure 4-1) from the Analog Patch Panel:

a. Remove power from patch panel by disconnecting AC line cord.

b. Remove seven screws securing top cover of patch panel.

WARNING

Insure that AC line cord is disconnected before performing proceeding steps.

c. Remove two screws securing power supply to side of patch panel.

d. Unsolder light green ground wire and two large black and white wires from power supply.

e. Loosen four screws securing two black and two red wires on side of power supply and remove wires.

f. Remove power supply from patch panel.

4.2.1.8 POWER SUPPLY REPLACEMENT. - Perform the following procedure to replace the power supply (figure 4-1) in the Analog Patch Panel:

WARNING

Insure that AC line cord is disconnected before performing proceeding steps.

a. Place power supply in proper position and secure to patch panel with two screws.

b. Place large black and white wires and light green ground wire in proper position and solder to terminals.

c. Place two red and two black wires in proper position and tighten screws.

d. Replace top cover and secure with seven screws.

e. Replace power to patch panel by connecting AC line cord.

4.3 PREVENTIVE MAINTENANCE. - There are no preventive maintenance procedures for the Analog or Digital Patch Panels.

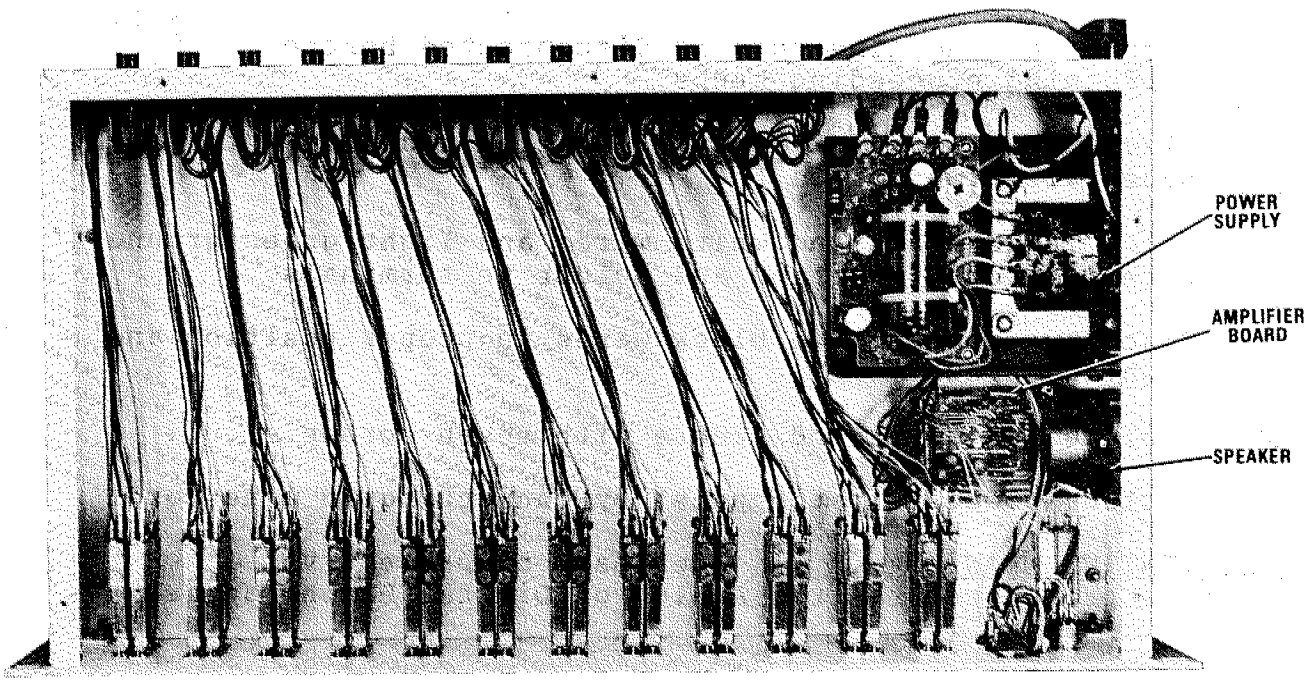


Figure 4-1. Analog Patch Panel Internal Parts Location

SECTION 5

PARTS LIST

5.1 INTRODUCTION. - This section provides the parts lists for the Analog and Digital Patch Panels. Table 5-1 provides the parts list for the Analog Patch Panel and table 5-2 provides the parts list for the Digital Patch Panel.

Table 5-1. Analog Patch Panel Parts List

NAME OF PART/DESCRIPTION	MANUFACTURER	JAN/MIL PART NO.	QTY.
Desg/Pls .25x15.56	Dynatech	101510-3421	2
Front Panel	Dynatech	501050	1
Chassis	Dynatech	511005	1
Cover	Dynatech	156-5-2-3-1	2
Variable Resistor	Clarostat	RV6NAYSD104A	1
Fuse, 1/2 A, S-B	Littelfuse	313.500	1
Fuse Holder	Littelfuse	342004	1
Power Supply, +5V, 4A	Powertec	2B5-3B	1
Toggle Switch	C and K	7201MDZQ	1
Socket Contact	AMP	207437-2	120
2 + 1 Bantam Jack	ADC	PJ931W	24
Bantam Jack	ADC	PJ938W	2
Lug Terminal	H. H. Smith	1416-6	1
Lug Terminal	AMP	52948	2
Lug Terminal	AMP	52923	2
Ser Din Recepticle	AMP	207333-1	24
Phone Tip Jack	H. H. Smith	202-102	1
Phone Tip Jack	H. H. Smith	202-103	1
Wire, 20 Ga., Red/Wht.	Belden		4 ft
Wire, 24 Ga., Blk.	Teledyne	1061241	27 ft
Wire, 24 Ga., Brn.	Teledyne	1061241	27 ft
Wire, 24 Ga., Red	Teledyne	1061241	27 ft
Wire, 24 Ga., Orn.	Teledyne	1061241	27 ft
Wire, 24 Ga., Yel.	Teledyne	1061241	27 ft
Wire, Blk./Wht., Twst Pr.	Belden	8460	2 ft
Power Cord	Belden	17239	1
Speaker	Quam	23A05	1
Screw, PNHSL, 4-40x5	Mil	MS35233-14	10
Screw, PNHCR, 4-40x5	Mil	MS51957-14	50
Screw, FLHCR, 4-40x4	Mil	MS24693C-2	10
Screw, FLHCR, 6-32x6	Mil	MS24693C-26	4
Nut, LKG, #6	ESNA	79NTM-62	4
Standoff, 6/10 FB6D	Amatom	8516-B-0632	2
SPCR, 4LG x #8 N 6D	Amatom	9317-N-171	4
Washer, Lock, No. 4	Mil	MS35338-135	50
Knob	Raytheon	50-2-1	1
Shrink Tubing	Alpha	FIT-221-.75	10 ft
Strain Cable Clamp	Heyco	SR-5P-4	1
Speaker PCB Assembly	Dynatech	156-8-3-3-2-2	1
Resistor, .1K, .25W	Mil	RCR07G100JS	1
Resistor, 1K, .25W	Mil	RCR07G102JS	4
Resistor, 10K, .25W	Mil	RCR07G103JS	4
Resistor, 100K, .25W	Mil	RCR07G104JS	2
Capacitor, 100V, 1MF	Mil	C350C105K1R5CA	2
Capacitor, 16V, .1MF	Centralab	UK16-104	1
Capacitor, 20V, 10MF	Sprague	150D106X9020B2	2

Table 5-1. Analog Patch Panel Parts List (continued)

NAME OF PART/DESCRIPTION	MANUFACTURER	JAN/MIL PART NO.	QTY.
Capacitor, 16V, 100MF	Sprague	199D107X0016FA2	3
Capacitor, 20V, 10MF	Sprague	196D106X9020JE3	1
Capacitor, 35V, 4.7MF	Sprague	196D475X9035JA1	1
Capacitor, Elec., 40V, 220MF	Siemems	B41283	1
Transistor	Motorola	3N187	1
IC, op. Amp.	Motorola	MC1741CP1	1
IC, And. Pwr. Amp.	National	LM386N-1	1
Screw, PNHCR 6-32x4	Mil	MS51957-26	2
Washer, Lock #6	Mil	MS35338-136	2
Angle Bracket	Keystone	614	2
PCB, Speaker Amp.	Dynatech	156-8-3-3-1	1
PCB, Schematic	Dynatech	156-8-3-3-2	Ref
Nameplate	Dynatech	780074-11	1
Label, VF Cable Wiring	Dynatech	780202-1	1
Label, VF Chassis Conn.	Dynatech	780202-2	1
Schematic	Dynatech	203705	Ref
24 Circuit Jack	Dynatech	DP-24-5	6
32 Circuit Jack	Dynatech	DP-32-5	6

Table 5-2. Digital Patch Panel (157-011-00) Parts List

NAME OF PART/DESCRIPTION	MANUFACTURER	JAN/MIL PART NO.	QTY.
Patch Panel	Dynatech	157-011-00	1
24 Circuit Jack	Dynatech	DP-24-5	6
32 Circuit Jack	Dynatech	DP-32-5	6

Table 5-3. Digital Patch Panel (157-002C-00) Parts List

NAME OF PART/DESCRIPTION	MANUFACTURER	JAN/MIL PART NO.	QTY.
Patch Panel	Dynatech	157-002C-00	1
24 Circuit Jack	Dynatech	DP-24-5	12